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(56) Documents cited

GB 0504705 A GB 0387774 A EP 0305669 A1

(58) Field of search

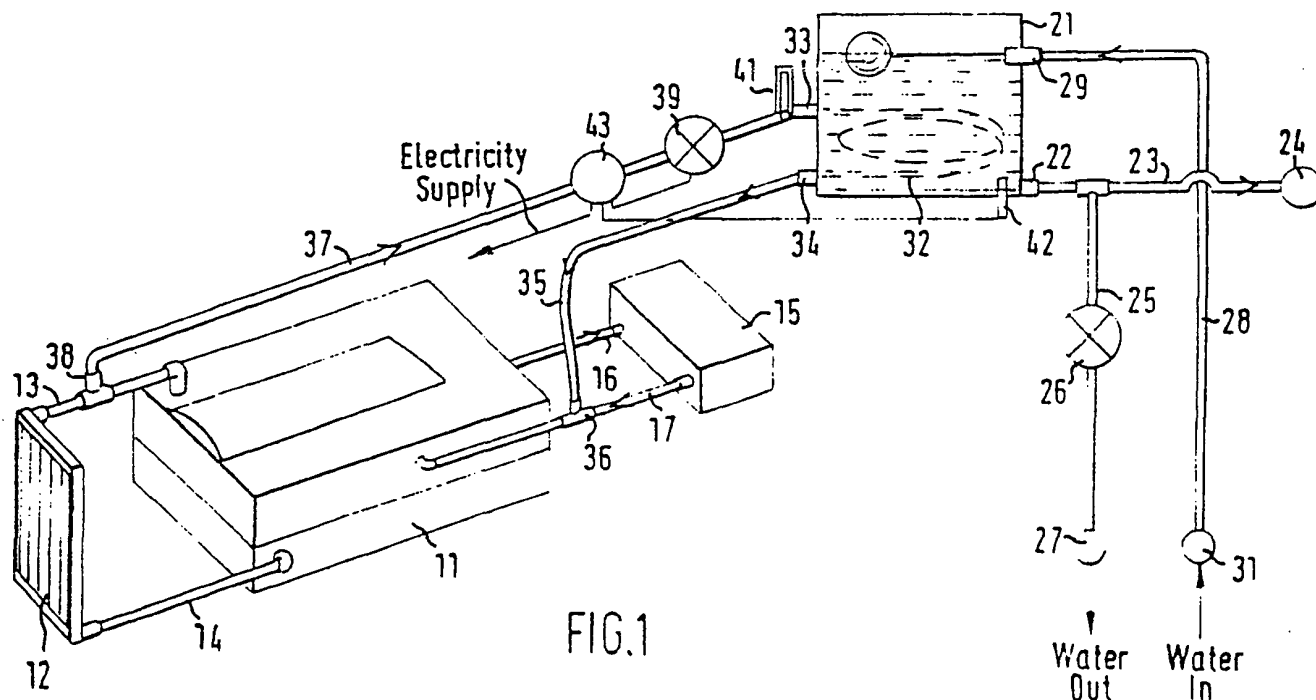
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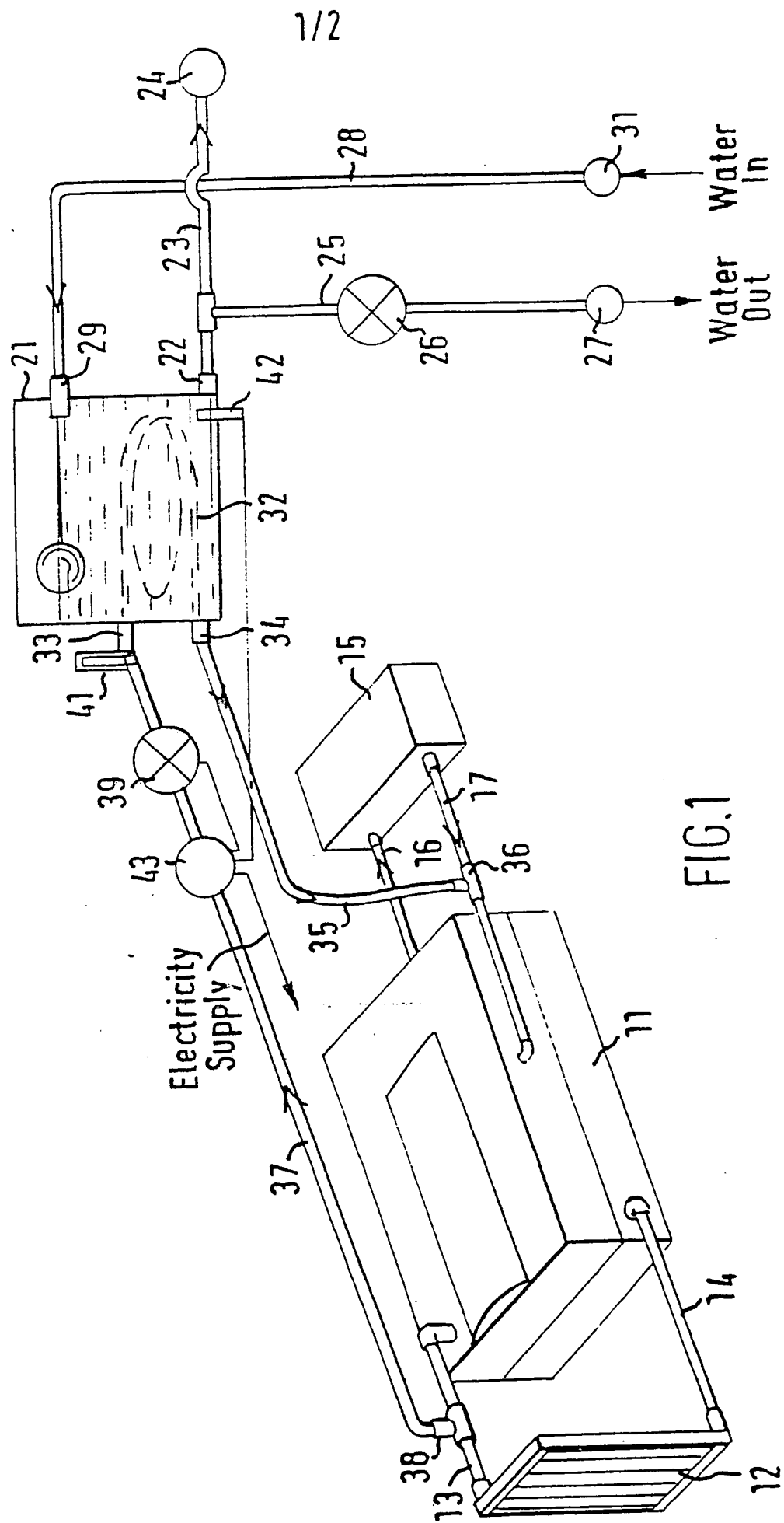
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Online databases: WPI

## (54) A hot water supply system for a vehicle

(57) A hot water supply system for a vehicle, particularly a horse box, having a liquid cooled internal combustion engine (11). The system has a storage tank (21) with a supply outlet (22) and a supply inlet valve (29) connectable via conduit (28) to a water supply. A tubular heating element (32) is located in the tank (21) and is connectable to the vehicle cooling system through the vehicle radiator or heater hoses so that the engine liquid coolant can be passed through the heating element for heating water in the tank. The outlet (22) can be connected to a shower head (24) in the vehicle or a water outlet arranged externally of the vehicle.





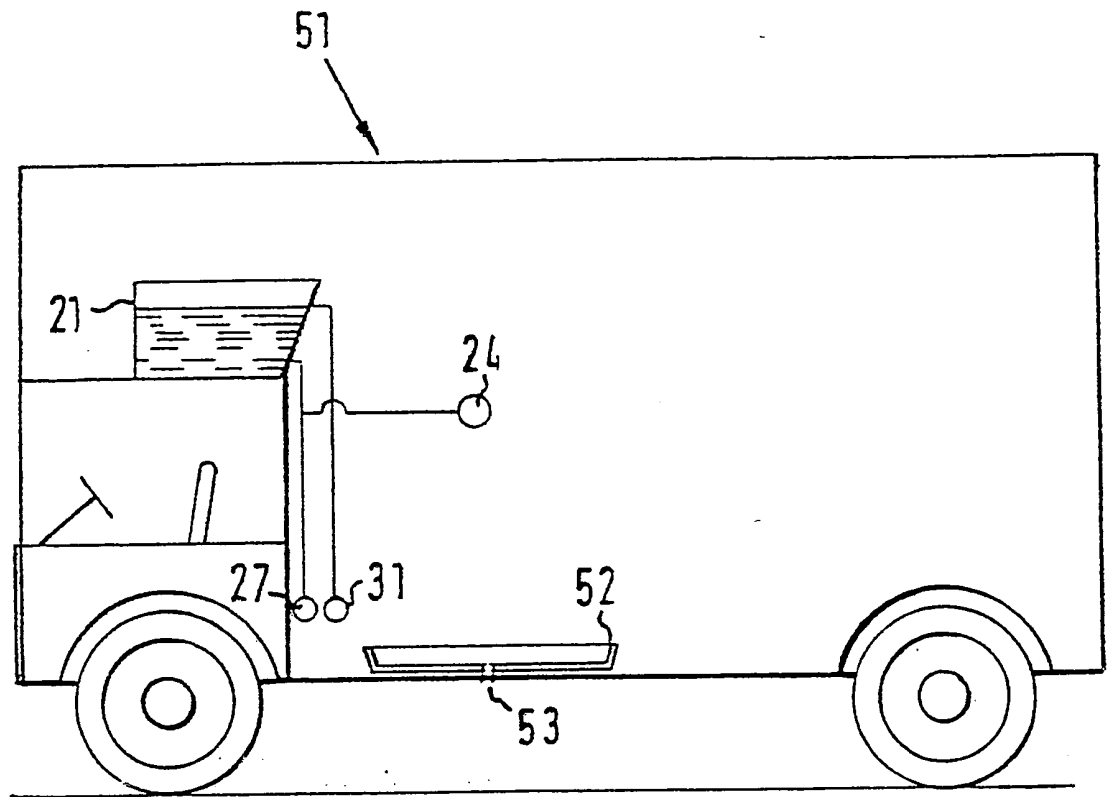


FIG. 2

A Hot Water Supply System for a Vehicle

This invention relates to hot water systems for vehicles and vehicle towed trailers, and in particular to a hot water system that can be fitted in horse boxes to provide hot water on board the vehicle for washing of riding equipment, horses, etc.

When a rider is competing in horse riding events in the heart of the country there are very few facilities for the cleaning of either the rider, the equipment, or the horse. The present invention provides a hot water system for installation in a vehicle, particularly a self-drive horse box, which will provide hot water, and is economic to install and operate.

The system may also be fitted into towed trailers or caravans.

Accordingly there is provided a hot water supply system for a vehicle having a liquid cooled internal combustion engine and which comprises a storage tank having a supply outlet and a water supply inlet valve connectable via conduit to a water supply, a tubular heating element located in the tank and having an input connectable via conduit to the cooling system

of the vehicle engine, and an output also connectable via conduit to the engine cooling system, so that the engine liquid coolant can be passed through the heating element for heating the water in the tank.

Preferably the inlet valve is operable to shut off the water supply when the water in the tank has reached a predetermined level.

Preferably the system further includes a first connector for connecting the heating element input conduit into the top hose of the vehicle engine cooling system, and a second connector for connecting the heating element output conduit into the vehicle heater return hose.

Also according to the invention there is provided a towed trailer, or caravan, or a motor vehicle, preferably a motorised horse box, having a liquid cooled engine and which includes a hot water supply system as described above.

The hot water supply system being heated by the waste heat from the internal combustion engine is extremely cheap to operate. Furthermore since the engine coolant passes through the hot water heating element, there is no need to drain the system in winter since it will be protected by the anti-freeze in the engine coolant. Also the engine coolant contains inhibitors which will prevent corrosion of the

heating element and other components of the system.

The invention will be described by way of example and with reference to the accompanying drawings in which:-

Fig 1 is a schematic drawing of a hot water supply system according to the invention, and

Fig 2 is a sketch of a motorised horse box also according to the present invention.

With reference to Fig 1 there is illustrated in schematic form a hot water system according to the invention.

A motor vehicle includes an internal combustion engine 11, usually a diesel engine or a petrol engine whose cooling system includes a radiator 12 connected to the engine water jacket by the usual top and bottom hoses 13 and 14 respectively. Preferably the vehicle also includes a passenger compartment heater 15 also connected into and forming a part of the engine cooling system. The heater 15 has inlet and return hoses 16 and 17 respectively to the engine cooling system in the conventional manner.

The hot water supply system comprises a storage tank 21 having a water supply outlet 22 which is connected by one conduit 23 to a shower head 24 and by a second conduit 25 to a lift pump 26 which in turn is connected to an outlet point in the form of a connector 27. The pump 26 is a 12 volt DC

pump that operates off the vehicle electrical supply system. The connector 27 is preferably a self-sealing connector into which a water implement such as a supply hose, a washing spray, or a washing brush can be connected.

The storage tank 21 is fed by a supply conduit 28 which is connected to a supply inlet valve 29 for example a ball cock valve which shuts off the water supply when the water in the tank 21 reaches a predetermined level. The supply conduit 28 has a connector, preferably a quick connect self sealing connector 31 at its end for receiving a water supply hose for filling the tank 21.

There is also a heating element 32 located in the tank. The heating element 32 is basically a loop or coil of hollow metal tube, preferably copper or stainless steel, which is heat conductive. The heating element has an input 33 and an output 34. In use the output 34 is connected via flexible conduit 35, preferably reinforced hose, to a connector 36 fitted into the heater return hose 17 of the vehicle cooling system. In use the heating element input 33 is connected via a flexible conduit 37 and connector 38 into the top hose of the engine cooling system.

A circulation pump 39 is fitted into the conduit 38 to pump engine coolant around the water heating system. The pump is a 12 volt DC operated pump. An air ventilation valve 41 is

located downstream of the pump 39 immediately before the tank 21.

The pump 39 is controlled by a heat sensitive probe 42 which includes a thermostatic electrical control circuit for operation of electrical equipment and which senses the temperature of the water in the tank 21 switch the electrical supply to the pump 39 on or off in order to cause the pump to operate or not dependant upon the water temperature.

Downstream of the pump 39 is an electrically operated control valve 43 which is also opened or closed by the thermostatic heat probe 42 so that coolant supply to the tank heating element 32 can be closed off if the water temperature reaches or exceeds a predetermined value.

Because the hot water supply system is connected into the vehicle engine cooling system it is protected from corrosion by the engine coolant inhibitors. The heating element 32 can be made from a material which is compatible with a particular type of coolant. For example a cast iron engine may be cooled by a different anti-freeze type coolant than an aluminium engine.

Fig 2 illustrates a mobile horse box 51 in which the hot water system may be used. Whilst the tank 21 is shown in the elevated position it could be mounted down on the chassis of



the vehicle since the system includes pumps.

The water supply inlet connector 31, and the water outlet connector 27 are mounted externally of the vehicle. The shower head 24 is arranged in the vehicle at a convenient point which will accomodate a portable shower tray 52. The shower tray is placed on the floor of the vehicle with its drain point 53 passing through the floor of the vehicle.

The water tank 21 may have a thermal mass, such as high density bricks of the type used in electrical night storage heaters, placed therein to help maintain the temperature of the hot water after the vehicle has stopped. The bricks absorb the heat from the water and then give the heat out when the vehicle engine has stopped.

The hot water system may be fitted to towed horse boxes, or trailers, and caravans. A tow vehicle engine cooling system may be connected to quick connect couplings at the rear of the vehicle by pipes, preferably stainless steel, passing underneath the vehicle and terminating in the quick connect leak proof couplings. These couplings are connectable with like couplings fitted to input and output ends of the water heating system. The tank can be installed in the trailer or caravan at any convenient point. The electrical pumps and valves of the system can be connected into the trailer electrical system.

Claims

1. A hot water supply system for a vehicle having a liquid cooled internal combustion engine and which comprise a storage tank having a supply outlet, and a water supply inlet valve connectable via conduit to a water supply, a tubular heating element having an input connectable via conduit to the cooling system of the vehicle engine, and an output also connectable via conduit to the engine cooling system, so that the engine liquid coolant can be passed through the heating element for heating the water in the tank.
2. A hot water supply system as claimed in Claim 1 wherein the water supply inlet valve is operable to shut-off the water supply when water in the tank reaches a predetermined level.
3. A hot water supply system as claimed in Claim 2 and further comprising in the conduit to the heating element input, a circulating pump, and upstream thereof a shut-off valve which are both connected to a water temperature sensor which senses the temperature of the water in the supply system to shut off the coolant circulation when the water reaches a predetermined temperature.
4. A hot water supply system as claimed in any one of Claims 1 to 3, further including an air vent located in the

conduit to the heating element input immediately upstream of the tank.

5. A hot water supply system as claimed in any one of Claims 1 to 4 in which the tank supply outlet is connected via conduit to a lift pump which is further connected to a water outlet.

6. A hot water supply as claimed in any one of Claims 1 to 5 wherein the tank inlet conduit terminates in a connector for connection to a water supply system.

7. A hot water supply as claimed in Claim 5, when dependant upon Claim 3, wherein the pumps can be powered by the vehicle electrical supply system.

8. A hot water supply system as claimed in any one of Claims 1 to 7 and further including a first connector for connecting the heating element input conduit into the top hose of the vehicle engine cooling system, and a second connector for connecting the heating element output conduit into the vehicle heater return hose.

9. A motorised vehicle having a liquid cooled internal combustion engine and which has an on board hot water supply system as claimed in any one of Claims 1 to 8.

10. A motorised vehicle as claimed in Claim 9 wherein the water supply heating element has its input connected to the vehicle cooling system top hose, and the heating element output is connected into the vehicle heater return hose.

11. A motorised vehicle as claimed in Claim 9 or Claim 10 wherein said pumps are connected into vehicle electrical supply system.

12. A motorised horse box being a vehicle as claimed in one of Claim 9, 10, or 11, wherein the water tank supply outlet is connected to a shower head within the vehicle.

13. A motorised horse box as claimed in Claim 12 and further including a portable shower base which can be stood on the floor of the horse box and which drains through the vehicle floor.

14. A motorised horse box as claimed in Claim 12 or Claim 13, wherein the water tank supply outlet is also connected to a hot water supply point mounted externally of the vehicle.

15. A trailer or caravan for attachment to a vehicle having a liquid cooled internal combustion engine, and which includes an on-board hot water supply system as Claimed in any one of Claims 1 to 8 which is connectable to the vehicle cooling system.

Relevant Technical fields

(i) UK Cl (Edition K ) F4U (U41), F4A (AJF)

(ii) Int Cl (Edition 5 ) F24D 17/00

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASE(S): WPI

Search Examiner

ALEXANDER G SMITH

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27 NOVEMBER 1991

Documents considered relevant following a search in respect of claims 1-14

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 504705 (KRUPP) See lines 1-4 on page 2	1, 12
Y	GB 387774 (H.V. HURLINGHAM LIMITED)	1, 8-10
Y	EP 0305669 (KASSBOHRER FAHRZEUG)	1, 8-10